WHAT IS CLAIMED IS:

1. A method for producing nano-carbon materials, characterized said method includes a step wherein (i) a starting material comprising one or more kinds of compounds selected from the group consisting saturated hydrocarbons, unsaturated hydrocarbons, saturated cyclic hydrocarbons, and alcohols whose atomic ratio of the component carbon to the component oxygen is more than 2.0 and (ii) a catalyst comprising one or more kinds of materials selected from the group consisting of transition metal element-containing materials, alumina, silica, and silicon carbides are together treated at a temperature in a range of from 100 to 800 ℃ while being compressed at a pressure in a range of from 0.2 to 60 MPa, where said starting material is converted into a supercritical fluid or a subcritical fluid while said supercritical fluid or said subcritical fluid being contacted with said catalyst, thereby to obtain a reaction product containing nano-carbon materials.

2. A method for producing nano-carbon materials, characterized said method includes a step wherein (i) a starting material comprising one or more kinds of compounds selected from the group consisting saturated hydrocarbons, unsaturated hydrocarbons, saturated cyclic hydrocarbons, and alcohols whose atomic ratio of the component

carbon to the component oxygen is more than 2.0, (ii) a catalyst comprising one or more kinds of materials selected from the group consisting of transition metal element-containing materials, alumina, silica, and silicon carbides and (iii) a supplementary material capable of functioning as a reaction promotion medium are together treated at a temperature in a range of from 100 to 800 ℃ while being compressed at a pressure in a range of from 0.2 to 60 MPa, where at least said supplementary material is converted into a supercritical fluid or a subcritical fluid and said starting material is contacted with said supercritical fluid or said subcritical fluid formed from said supplementary material while being contacted with said catalyst, thereby to obtain a reaction product containing nano-carbon materials.

3. The method according to claim 2, wherein said supplementary material is at least one kind of a material selected from the group consisting of a solvent to dissolve said starting material, a solvent to dissolve the catalyst, water, helium gas, argon gas, nitrogen gas, hydrogen gas, carbon monoxide, nitrous oxide, and ammonia.

4. The method according to claim 1, wherein at least one kind of a material selected from the group consisting of a solvent to dissolve said starting material, a solvent to dissolve the catalyst, water, helium

gas, argon gas, nitrogen gas, hydrogen gas, carbon monoxide, nitrous oxide, and ammonia is added to contact with said supercritical fluid or said subcritical fluid formed from said starting material.

5. The method according to claim 3 or 4, wherein said solvent to dissolve said starting material is at least one kind of a material selected from the group consisting of carbon dioxide, aromatic hydrocarbons, and ethers.

6. The method according to claim 1 or 2, wherein said pressure is in a range of from 2 to 40 MPa.

7. The method according to claim 1 or 2, wherein said temperature is in a range of from 200 to 650 ℃.

8. The method according to claim 1 or 2, wherein said starting material has a dielectric constant in a range of from 1.5 to 25.0 at 25 ℃.

9. The method according to claim 1 or 2, wherein said transition metal element-containing material is at least one kind of a material selected from the group consisting of transition metals and transition metal compounds.

10. The method according to claim 9, wherein said transition metal compound is selected from the group consisting of transition metal sulfides, transition metal carbides, organo transition metal compounds, transition metal nitrides, transition metal oxides, and transition metal salts.

11. The method according to claim 9, wherein said transition metal or said transition metal compound comprises one or more kinds of transition metal elements selected from the group consisting of Ni, Co, Fe, Cu, Ag, Cr, W, Mo, Ti, Ru, Rh, and Pd.

12. The method according to claim 1, wherein a surfactant is made to present together with said catalyst.

13. The method according to claim 1 or 2, which further includes a step wherein said reaction product containing nano-carbon materials is heat-treated at a temperature in a range of from 400 to 2800 ℃.

14. The method according to claim 13, wherein the heat treatment is performed at a temperature in a range of from 600 to 2200 ℃.

15. The method according to claim 13, wherein said reaction product containing nano-carbon materials is heat-treated at a temperature in a range of from 400 to 900 ℃, followed by being heat-treated at a temperature in a range of from 900 to 2800 ℃.

16. The method according to claim 13, wherein the heat treatment is performed in a gaseous atmosphere composed of one or more kinds of gases selected from the group consisting of argon gas, helium gas and nitrogen gas.

17. The method according to claim 1 or 2, wherein said nano-carbon materials contained in the reaction product

comprise a plurality of microunits shaped in a filament-like form (or a worm-like form), a tubular form or a form comprising a combination of these forms.

18. The method according to claim 17, wherein said plurality of microunits have a diameter in a range of from 4 to 400 nm.

19. The method according to claim 18, wherein said plurality of microunits comprise an aggregate comprising a plurality of microunits having an average diameter in a range of from 4 to 400 nm which are gathered.

20. The method according to claim 17, wherein said plurality of microunits have a length in a range of from 100 nm to 100 μm.

21. The method according to claim 17, wherein said plurality of microunits have a transition element therein or at their tip portion.

22. The method according to claim 21, wherein said plurality of microunits have a transition metal, a transition metal oxide, a transition metal carbide, or a transition metal sulfide therein or at their tip portion.

23. The method according to claim 17, wherein said nano-carbon materials which comprises said plurality of microunits have a microstructure having a hollow tubular structure in that a plurality of graphene sheets wound slantingly to a fiber axis into a megaphone-like form are

stacked into a tubular form or a graphene sheet is wound singly or in multiple in a direction parallel to a fiber axis into a cylindrical form.

24. The method according to claim 17, wherein said nano-carbon materials which comprise said plurality of microunits have a microstructure comprising a platelet type graphite nanofiber in which a plurality of graphene sheets are stacked vertically to a fiber axis or a herring-bone type graphite nanofiber in which a plurality of graphene sheets are stacked slantingly to a fiber axis, or have a microstructure in that a plurality of graphene sheets shaped in a cup-like are stacked into a filament-like state.

25. The method according to claim 1 or 2, wherein said starting material is in the liquid state or in the gaseous state in an environment with normal temperature and normal pressure.